this amount shall be held to include any disbursements by him for clerical assistance.

The motion was carried.

Resignations were read and accepted from Mr. Macy Carhart and Mr. Gifford Pinchot.

Adjourned.

PERCY WILSON,
Secretary.

OF INTEREST TO TEACHERS*

THE SCIENTIFIC SPIRIT

Under "Practical Science" Professor John M. Coulter discusses (*Science*, June 10, 1910) the scientific attitude of mind or the scientific spirit. He describes three of its useful characteristics: First, that it is a spirit of inquiry, and in connection with this he makes the statement that it "is not the spirit of unrest, of discomfort, but the evidence of a mind whose every avenue is open to the approach of truth from every direction. For fear of being misunderstood, I hasten to say that this beneficial result of scientific training does not come to all those who cultivate it, any more than is the Christ-like character developed in all those who profess Christianity. I regret to say that even some who bear great names in science have been as dogmatic as the most rampant theologian. But the dogmatic scientist and theologian are not to be taken as examples of 'the peaceable fruits of righteousness,' for the general ameliorating influence of religion and of science are none the less apparent."

Second, it is a "spirit which demands that a claimed cause shall be demonstrated. It is in the laboratory that one first really appreciates how many factors must be taken into the count in considering any result, and what an element of uncertainty an unknown factor introduces. Even when the factors of some simple result are well in hand, and we can combine them with reasonable certainty that the result will appear, we may be entirely wrong in our conclusion as to what in the combination has produced the result. For example, the forms of certain plants were changed at will, by supplying to their surrounding medium various substances. It was easy to obtain definite results, and it was natural to conclude that the chemical structure of these particular substances produced the result, and our prescription was narrowed to certain substances. Later it was discovered that the results are not due to the chemical nature of the substances, but to a physical condition developed by their presence, a condition which may be developed by other substances or by no substances, and so our prescription was much enlarged."

---

* Conducted by Miss Jean Broadhurst, Teachers College, Columbia University.

Professor Coulter calls attention to the fact that the "prevailing belief among the untrained is that any result may be explained by some single factor operating as a cause. They seem to have no conception of the fact that the cause of every result is made up of a combination of interacting factors, often in numbers and combinations that are absolutely bewildering to contemplate." Though it is fortunate when leaders, as in public opinion, "have gotten hold of one real factor," this habit of "considering only one factor, when perhaps many are involved, indicates a very primitive and untrained condition of mind."

Third, this spirit keeps one close to the facts. "There seems to be abroad a notion that one may start with a single well-attested fact, and by some logical machinery construct an elaborate system and reach an authentic conclusion, much as the world has imagined that Cuvier could do if a single bone were furnished him. The result is bad, even though the fact may have an unclouded title. But it happens too often that great superstructures have been reared upon a fact which is claimed rather than demonstrated. Facts are like stepping stones; so long as one can get a reasonably close series of them he can make some progress in a given direction, but when he steps beyond them he flounders. As one travels away from a fact its significance in any conclusion becomes more and more attenuated, until presently the vanishing point is reached, like the rays of light from a candle."

Such 'vain imaginings' are "delightfully seductive to many people, whose life and conduct are even shaped by them. I have been amazed at the large development of this phase of emotional insanity, commonly masquerading under the name of 'subtle thinking.' Perhaps the name is expressive enough, if it means thinking without any material for thought. And is not this one great danger of our educational schemes, when special stress is laid upon training? There is danger of setting to work a mental machine without giving it suitable material upon which it may operate, and it reacts upon itself, resulting in a sort of mental chaos. An active mind, turned in upon itself, without any valuable objective material, certainly can never teach any very reliable results. It is the trained scientific spirit which recognizes that it is dangerous to stray away very far from the facts, and that the farther one strays away the more dangerous it becomes, and almost inevitably leads to self-deception.

This Professor Coulter feels is the attitude of mind that scientific training is contributing to the service of mankind—contributing as an ideal which is already yielding tremendous results, and as a force accumulating momentum for a larger expression.

In response to appeals from various scientific bodies, the Smithsonian Institution has concluded the preparations for a biological survey of the Panama Canal Zone. Friends of the Institution have contributed funds for the expenses of the investigators, as it is felt a properly conducted survey would yield important scientific results. "It is known that a certain number of animals and plants in the streams on the Atlantic side are different from those of the Pacific side, but as no exact biological survey has ever been undertaken, the extent and magnitude of these differences have yet to be learned. It is also of the utmost importance to determine exactly the geographical distribution of the various organisms inhabiting those waters, as the Isthmus is one of the routes by which animals and plants of South America have entered North America and *vice versa*. When the canal is completed the organisms of the various watersheds will be offered a ready means of mingling together, the natural distinctions now existing will be obliterated, and the data for a true understanding of the fauna and flora placed forever out of reach."

"By the construction of the Gatun Dam a vast freshwater lake will be created, which will drive away or drown the majority of the animals and plants now inhabiting the locality, and quite possibly exterminate some species before they become known to science."

Miss Graham, studying *Conocephalum conicum* (*Fegatella conica*), finds that at Ithaca, N. Y., the gametophores begin to appear in June, that fertilization takes place about the first of July, that the spores are fully formed before the beginning of winter, and that in the following May the gametophore stalk rapidly elongates. This elongation is quickly followed by the elongation of the stalk of the sporogonium. The venter of the archegonium is two-layered at the time of fertilization, and soon becomes a massive calyptra. The first division of the fusion nucleus gives rise to free nuclei, which may lie parallel with or transversely to the major axis of the archegonium. A cell wall is not laid down until some little time has elapsed after division of the fusion nucleus; when the wall appears, it is transverse. By successive transverse divisions a filament of four or five cells is formed. This observation differs from that of Cavers, who described an octant stage. The first longitudinal walls appear in the outer or capsule end of the filament. At the time of separation of the mother cells, the growth of the capsule is checked, while the calyptra continues growth, leaving quite a space between capsule and calyptra. The capsule and seta soon resume growth, fill the cavity, and distend the calyptra. No pseudoperianth, such as is found in *Marchantia*, is present. A sheath, which is a specialized portion of the gametophore, invests the calyptra. (W. J. G. Land, *Botanical Gazette*, February.)

Duncan S. Johnson, in the December *Journal of the New York Botanical Garden* calls attention to a heavy flood (November and December, 1909) in the Blue Mountain region of Jamaica, in which "scores of acres of coffee fields were stripped to the bare rock" and "even the primeval forest of the valley bottoms was swept out and carried down to the sea." The "gray desert" appearance in June, 1910, is described, and the sparse and hardly typical new growth is noted. It is expected that this "occupation of a virgin soil by a new plant covering" will prove as interesting as that previously described after the volcanic disturbances at Krakatoa. It certainly adds a new type to the work previously done at Krakatoa and along the ocean, and to that now being conducted at the Salton Sea.

A paper by C. V. Piper on botany in its relation to agricultural advancement, too varied to be abstracted here, appeared some months ago in *Science* (June 10, 1910). Hybrids, sports, and other plant variations—especially with reference to cultivated or agricultural plants are discussed in a way to be interesting even to the general reader.

The Nature Study Review for November, 1910, contains two articles of interest to high school teachers. One is by Alice J. Patterson on potatoes and oats as nature study topics. It includes much in subject matter and method that would be helpful in the first year high school classes. The cuts are especially interesting. The first is of the first potato introduced into Europe from a water color of 1588 by Clusius; the second shows potato *fruits*, about one inch in diameter.

The second article is by Frederick L. Holtz on weeds, the common kinds, and the methods of eradicating them. It is in a form suitable for high school reading.

The question of coastal subsidence is discussed again in a recent *Science* (January 6, 1911) by H. H. Bartlett. Conditions near Buzzard's Bay where fresh water peat is found fourteen feet below sea level are given as proof of subsidence which is still going on. The controversy is continued in the same journal (January 13 and February 24). In the latter issue D. S. Johnson writes to explain some of the facts used by Mr. Bartlett, in a way that leaves coastal subsidence very much of an open question.